Attachment B

Responsiveness Summary

for Public Comments on the Engineering Evaluation/Cost Analysis
Slip 4 Early Action Area
Lower Duwamish Waterway Superfund Site, Seattle, WA

This document summarizes and responds to public comments submitted on the Engineering Evaluation/Cost Analysis (EE/CA) for the proposed removal action at the Slip 4 Early Action Area at the Lower Duwamish Waterway Superfund Site in Seattle, Washington.

The EE/CA was available for public review and comment from February 17 through March 18, 2006. Notice of this comment period was published in the *Seattle Times* and *El Mundo* at the start of the 30-day public comment period. Notice of this public comment period was also announced in the February 24, 2006 edition of the Washington Department of Ecology's *Site Register* and by postcards in English and Spanish. Notice of the comment period, public meeting, and a summary of the proposed EE/CA alternatives were described in a Slip 4 Fact Sheet (February 2006) that was mailed to approximately 950 addresses. Fact sheets in Spanish (about 400) were also distributed. Announcements were also placed on EPA's website and the EPA web calendar. Public outreach was also performed by the Duwamish River Cleanup Coalition (DRCC), EPA's Community Advisory Group for the site.

EPA held a public meeting in the Georgetown neighborhood on March 7, 2006. The meeting was attended by approximately 120 people. Public comments were recorded by a court reporter.

EPA received eight comment letters and comment forms during the public comment period, and 14 individuals provided spoken comment at the public meeting. Original public comment documents and the transcript from the public meeting are provided in the administrative record. Consistent with EPA guidance (OSWER Directive 9360.3-01), responses to all significant comments are provided below. Each response includes a paraphrased summary of the original comment, as well as reference to the source of the comment. Several comments were made more than once. In these cases, the paraphrased summary may include more than one reference or may cross-reference other responses.

Some EPA responses include references to the *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites (EPA 2005)*, which is available from EPA's Superfund program website at http://www.epa.gov/superfund/resources/sediment/guidance.htm.

Sources of Comments on the Engineering Evaluation/Cost Analysis

Document	Author(s)	Description
DRCC	Duwamish River Cleanup Coalition (DRCC)	Comment letter dated March 17, 2006 – Incorporates and expands on comments provided by DRCC at March 7, 2006 Public Meeting
MITFD	Glen St. Amant, Muckleshoot Indian Tribe Fisheries Division (MITFD)	Comment letter dated March 17, 2006
WRIA	Doug Osterman, Water Resource Inventory Area 9 (WRIA 9) Watershed Coordinator	Comment letter dated March 17, 2006
CC1	Ms. L. Erie	Comment card
CC2	M.C. Halvorsen	Comment card
CC3	Patty Foley, Director of Georgetown Council	Comment card
Manson	Pat McGarry, Manson Construction Co.	E-mail dated February 21, 2006
BD	B. Dougherty	E-mail dated March 22, 2006
PC	14 individuals at the March 7, 2006 Public Meeting	Public comments provided at March 7, 2006 public meeting, as recorded in the court reporter's transcript

The comments in these documents have been numbered, and the document(s) and comment number(s) are identified in parentheses after each comment in this responsiveness summary.

Responses to Comments

1. **The organizations and communities represented by the Duwamish River Cleanup Coalition (DRCC) have serious concerns and reservations about cleanup plans for sites along the Duwamish River that leave substantial volumes of PCBs and other chemicals in place. Sediment caps have a relatively short history (about 20 years), capping technologies are incompletely demonstrated, and chemicals under caps may be eroded or released by earthquakes. All PCBs and similarly toxic substances should be removed from the river basin, rather than buried under a cap. EPA must demonstrate the effectiveness of capping and publish a report on the capping success and failure rate in this region. This is critical to providing adequate information to demonstrate that capping is safe over the long term and in the event of earthquakes and other catastrophic events. (DRCC-1; BD-2; PC-1; PC-13; PC-23; PC-29; PC-30)**

   EPA believes that capping is an effective solution for the contaminated sediments in Slip 4. In recent EPA *Contaminated Sediment Remediation Guidance* (EPA 2005), capping is identified as one of the three main cleanup approaches for contaminated sediment sites. Capping contaminated sediments is a proven method that has been successfully used in the Northwest to eliminate human and animal exposure to contamination.

   Caps are designed to reduce risk to people and the environment through the following primary functions (EPA 2005):

   - Caps are designed to physically isolate the contaminated sediment so that people and animals do not contact the contaminated sediment, and so that animals do not burrow into the sediments and move contaminants to the surface;

   - Caps are designed to isolate the chemicals beneath the cap, which minimizes the movement of contaminants into the water column;

   - Caps are designed to stabilize both the contaminated sediment and the cap itself to prevent either from being resuspended and transported from the capping location (e.g., due to storms or earthquakes).

   Once a sediment cap is constructed, EPA requires that the cap be routinely monitored to demonstrate that the cap remains effective and protective of people and the environment. Implementation of this monitoring ensures that the cap is performing the basic functions (physical isolation, chemical isolation, and sediment stabilization) as required to meet the removal action objectives. Also, EPA requires that monitoring be performed after major events such as earthquakes.

   Using the information collected during long-term monitoring activities at a sediment cap, EPA may require cap maintenance activities (e.g., repair and replenishment of erosion protection layers) and cap contingency actions (e.g., actions to be taken in the case that one or more cap

functions are not being met). For the Slip 4 Early Action Area, the City of Seattle and King County will perform required long-term monitoring activities and any necessary cap maintenance or cap contingency actions, pursuant to a legal agreement with EPA.

Additional information on capping is provided below.

EPA's *Contaminated Sediment Remediation Guidance* includes a summary of the extensive work that has occurred on capping remediation technologies (see Chapter 5). Chapter 5 also describes the site conditions that are important to understand when evaluating the feasibility and effectiveness of capping, and cap design requirements are detailed. Additional comprehensive technical guidance on design requirements for capping of contaminated sediments can be found in *Guidance for In-Situ Subaqueous Capping of Contaminated Sediments (EPA 1998)* and the *Assessment and Remediation of Contaminated Sediments Program Remediation Guidance Document (EPA 1994)*, which are available through EPA's website at http://www.epa.gov/glnpo/sediment/iscmain.

Regionally, for the overall Lower Duwamish Waterway Site, EPA and Ecology have approved a report that identifies sediment cleanup technologies that may be applicable to the contaminated sediments within the site. This report includes extensive information on capping [see Chapter 7.1 in *Identification of Candidate Cleanup Technologies for the Lower Duwamish Waterway Superfund Site (RETEC, December 12, 2005)*].

Finally, EPA's regional experience with capping is successful and well-documented. Caps have been in place for one to 18 years at a number of EPA Region 10 Superfund sites, including St. Paul Waterway and other Commencement Bay cleanup areas, Eagle Harbor, Puget Sound Naval Shipyard, and Pacific Sound Resources. Detailed documentation about the construction and monitoring of these sites, including remedial design documents, remedial action work plans, construction completion reports, long-term monitoring plans, and long-term monitoring results, are available at EPA Region 10's Superfund records center. These long-term monitoring results have shown that our Superfund sediment capping projects continue to be successful, and no remedy failures have occurred.

EPA understands that DRCC would appreciate further discussion on this topic, and we and the City of Seattle are committed to ongoing communications on this topic.

2. **Given the alternatives presented in the EE/CA, the recommended alternative (Alternative 2) has DRCC's qualified support, based on satisfactory resolution of the issues and comments detailed in our letter. (DRCC-3; PC-9)**

   Thank you for your support.

3. **As part of the overall cleanup and restoration of the Lower Duwamish, the Slip 4 early action can contribute to recovery of Chinook salmon by complementing other watershed habitat recovery efforts. The Water Resource Inventory Area 9 (WRIA 9) staff endorse the preferred alternative (Alternative 2). (WRIA-1)**

Thank you for your support.

4. **Alternative 2 offers the greatest amount and desired type of shallow water habitat rehabilitation for juvenile Chinook salmon. We commend the federal, state, and local agencies for including habitat rehabilitation as an integral part of the cleanup. (WRIA-2)**

   Comment noted.

5. **I strongly support Alternative 2. When compared with the other alternatives presented to the community, Alternative 2 removes the most harmful sediment from the river, allows for a maximum of habitat restoration, and provides some potential opportunities for future public access of the river. (BD-1)**

   Thank you for your support.

6. **Much of the support for Alternative 2 is driven by the habitat benefits that are included in Alternative 2, as well as not very good options for what else to do with the material that's down there. If we take the sediments out, they are not going to be treated or destroyed, they are going to be moved – and that's driving some of the support for capping. (PC-10)**

   Comment noted.

7. **The EE/CA does not include any details on how the cap can and will be designed to accommodate site conditions that may or will threaten the cap (e.g., earthquakes, prop wash). (DRCC-12; PC-27; PC-30)**

   The EE/CA includes general information on cap design requirements, including a discussion that caps would be designed for long-term seismic stability and resistance to erosive forces from outfall flows and propeller wash (e.g., see Section 4.4 and 5.5.1). However, specific design requirements are not determined until after the cleanup alternative has been selected by EPA, after consideration of public comments on the EE/CA. Design requirements will be described in the project design documents, including prefinal and final designs and construction plans and specifications. EPA has agreed to make these documents available to the public before they are final.

8. **Demonstrate how the cap will be designed to remain intact and functional with the hydrostatic pressure of groundwater from adjacent uplands beneath and beside the cap. (DRCC-4; PC-6)**

   The caps will be designed using well-established engineering guidance, which specifically deals with groundwater flow issues. The caps will be constructed of clean sand, gravel, and rock that allow groundwater to freely flow through the cap, so there will be no buildup of hydrostatic pressure behind or beneath the cap. Groundwater will continue to flow to Slip 4 in the same way it currently does.

While caps allow the groundwater itself to flow, they do not allow contaminants to move through the cap and cause recontamination of the surface. Caps are designed for *filtering*, which physically prevents any contaminated sediment particles from moving through the cap. Caps are also designed for *adsorption*, which prevents any dissolved contaminants from moving through the cap. The design will include specifications of cap materials and thicknesses that will ensure these cap functions are met.

Technical guidance on design requirements for capping of contaminated sediments can be found in *Guidance for In-Situ Subaqueous Capping of Contaminated Sediments (EPA 1998)* and the *Assessment and Remediation of Contaminated Sediments Program Remediation Guidance Document (EPA 1994)*, which are available through EPA's website at http://www.epa.gov/glnpo/sediment/iscmain.

9. Estimates of the area expected to be subject to scour near the outfall(s) should be presented in the EE/CA, and the scour footprint should be minimized through optimal design and channeling of the scour pathway. (DRCC-15)

The EE/CA (p. 83) includes a description of the general approach for directing outfall stormwater flows into a shallow swale that will be engineered into the cap at the head of the slip. As stated in the EE/CA, the swale is expected to occupy roughly 0.1 acre. (This description is presented under the Alternative 1 discussion but is also applicable to Alternative 2 and is referenced on p. 96 in the Alternative 2 discussion). The specific configuration of the swale will be optimized in the design, with a goal of optimizing habitat quality while providing appropriate erosion protection.

10. Capping with sand and gravel will not be very lasting or effective. When the sand and gravel washes away, the problem will still be there (CC2-2)

EPA's experience with other sediment caps has shown that a properly designed and engineered cap comprised of sand and gravel will be a protective cleanup remedy for Slip 4. Capping protectiveness and long-term performance is based on well-established scientific and engineering principles, well-defined legal mechanisms for land-use control, national EPA and Army Corps of Engineers guidance and policy, and an established track record of success regionally, nationally, and internationally. The cap will be designed so that the cap material will not wash away, and monitoring will confirm this and identify any need for maintenance. Also see Response to Comments 1, 7, and 8.

11. The cap design should be independently reviewed before EPA approval. (DRCC-8; PC-2)

EPA, and EPA's oversight contractor, will independently review all design documents submitted by the City of Seattle and King County before EPA approves the design documents.

12. The end of the navigation channel and the beginning of the cleanup area should be marked to prevent barges and tugs in Slip 4 from disturbing the cap. (DRCC-11; BD-5; PC-8)

EPA agrees that it will be important to implement measures that will minimize or eliminate disturbances of the sediment cap. Some of these measures will be incorporated into the design of the cap (e.g., larger-sized cobbles may be placed on the surface of the cap to minimize sediment erosion from vessels or stormwater discharges from pipes). Other measures, such as the need for signage or restrictions on site use, will be specified during cap design in the *Institutional Control Implementation Plan* (see pp. 86-88 of the EE/CA). This plan will include an analysis and recommendation of *institutional controls* that will be required to ensure the long-term protectiveness and integrity of the remedy, and would exist in perpetuity. Institutional controls are administrative and/or legal controls that help to minimize the potential for human exposure to contamination and/or protect the integrity of the remedy (see http://www.epa.gov/superfund/action/guidance/remedy/landuse.htm).

Under the selected cleanup alternative, the City of Seattle will be the owner of the property where the sediment cap is constructed, so it will have the ability to control site use.

13. After the cleanup is completed, monitoring of chemical contamination should occur in years 1, 2, and 3; don't wait until 5 years after cleanup. The cap should be inspected annually. Monitoring should include cap chemistry, habitat integrity, and shellfish quality. Initial monitoring should make sure recontamination is not occurring. Contingency plans should be developed for less than ideal results and responsibility for cap maintenance and repair should be assigned. (various comments provided by DRCC-9; CC3-2; MIFTD-2; BD-4; PC-5; PC-7; PC-28; PC-34)

After the cleanup is completed in Slip 4, monitoring will occur to ensure that the cleanup *remains* protective of people and the environment. EPA agrees that monitoring should not wait until year 5; typically, sampling occurs at least two or three times within the first five years. Monitoring will include visual inspections, bathymetric surveys, and sediment sampling and chemical analysis. The resulting monitoring data will be used to evaluate the long-term effectiveness and protectiveness of the remedy, and whether any contingency or corrective actions are necessary. Long-term monitoring is a standard component of EPA's cleanup program, and is generically described in Section 5 of the EE/CA. Further details on the development of an effective monitoring plan at contaminated sediment sites are described in Chapter 8 of EPA's *Contaminated Sediment Remediation Guidance*.

For Slip 4, the details for post-cleanup monitoring and contingencies will be set forth in a Long-term Monitoring and Reporting Plan that will be prepared by the City and County for EPA approval. This plan will be developed in consideration of site-specific conditions and information, including information on the final remedy that was constructed. This plan will be shared with the public during its development. The City and County will perform long-term monitoring with EPA oversight. Future long-term monitoring results will also be shared with the public. Long-term monitoring obligations will be set forth in a legal agreement between the City, County, and EPA, and this legal agreement will be finalized before the cleanup commences.

Within the Superfund Program in Region 10, EPA-approved long-term monitoring plans and results for sediment capping projects are available for projects including (but not limited to) the St. Paul and Olympic View Resource Area (Commencement Bay Nearshore/Tideflats Site), the Pacific Sound Resources Site, Eagle Harbor/Wyckoff Site, and Puget Sound Naval Shipyard.

14. A long-term monitoring program should be conducted to confirm the integrity of the cap in terms of resistance to human-caused disturbance, natural erosive forces, and biological activity. Given that cleanup project proponents are typically responsible for monitoring only the first ten years after project completion, and that data could be useful, we encourage EPA to explore ways to support additional monitoring. An adaptive management mechanism should also be provided for additional remedial action that may be necessary. Please share monitoring results with WRIA 9 Salmon Habitat Recovery Team. (WRIA-3)

For Superfund projects, long-term monitoring is not limited to only the first ten years. Before conducting the cleanup, EPA will have a legal agreement with the City of Seattle and King County that will require that long-term monitoring be performed as long as deemed necessary by EPA. Essentially, when contaminated sediments are left in place, some form of monitoring is required in perpetuity. The monitoring effort will include contingencies such as an adaptive management mechanism to ensure that the remedy remains protective of human health and the environment.

15. In order for the Tribe to support Alternative 2, assurances about long-term monitoring and success must be confirmed, including assurances that additional cleanup actions will commence if monitoring determines that the remedy was not successful in achieving the goals. (MIFTD-3)

EPA will ensure that long-term monitoring occurs to verify the continued effectiveness of the remedy in protecting human health and the environment and verify the continuing performance and structural integrity of barriers to contaminant transport. Should additional cleanup action ever prove necessary, EPA and/or Ecology will ensure that it is implemented.

Also, see Responses to Comment 1 and 13.

16. The statements that Alternative 2 provides the best protection of people and the environment, and that it is cost-effective, are not substantiated. (PC-25)

EPA believes that the EE/CA meets the requirements of EPA's regulations and guidance for removal actions, and documents that Alternative 2 is protective of people and the environment and is cost-effective. EPA understands that there are uncertainties associated with every decision that need to be weighed and evaluated, but decisions must be made in light of that uncertainty. EPA believes that given a large number of site-specific considerations, Alternative 2 is the best choice given a comparative analysis of removal action alternatives (see Sections 6 and 7 of the EE/CA).

Additional information on cost-effectiveness is provided on p. 7-3 of EPA's sediment guidance: "The evaluation of an alternative's cost effectiveness is usually concerned with reasonableness of the relationship between the effectiveness afforded by each alternative and its costs when compared to other available options."

17. Regardless of which alternative is selected, we fully support habitat enhancement being a part of this cleanup project. (PC-12)

Comment noted.

18. The proposed habitat enhancement in Alternative 2 has the potential to provide a permanent, positive change in the nature of the shoreline and immediate upland habitat. Clear administrative requirements in EPA's cleanup order must ensure that the habitat area and quality be maintained. (DRCC-14; PC-7)

EPA agrees.

19. There is a "hot spot" of PCB contamination on the south side of Slip 4 near stations SL4-10/10A that should be removed when the dredging is conducted. This station has high levels of PCBs in surface sediments to two feet deep. Removing sediments in this area would add minimal cost and would remove another area of high concentration contamination. (DRCC-6; PC-4)

EPA agrees that sediments near Station SL4-10/10A are contaminated with PCBs. However, EPA does not agree that these sediments represent a "hot spot" of PCB contamination that requires physical removal. We believe that the selected cleanup remedy (i.e., capping) will effectively isolate the PCB contamination at this station, and that the remedy will be protective of human health and the environment over the long term.

First, EPA does not consider the PCB concentrations at Station SL4-10/10A to be a "hot spot" area based on the nature and extent of site-specific PCB concentrations reported for the Slip 4 Early Action Area (see Chapter 2 of the EE/CA). The sample mentioned in the comment was collected over 15 years ago, and more recent data collected near this station show that PCB concentrations in the top 4 to 6 inches of sediments are far below the State Cleanup Screening Level (see Figure 2-10 of the EE/CA). Second, concentrations of PCBs in the sediments at this station are not substantially different than PCB concentrations in other areas that will be effectively contained by capping as part of this removal action. EPA believes that the removal of additional sediments in the vicinity of this station will not contribute to overall net risk reduction in Slip 4. As described in EPA's *Contaminated Sediment Remediation Guidance*, deeper contaminated sediment that is not currently bioavailable or bioaccessible, and that is unlikely to be exposed in the future, does not necessarily contribute to site risks and may not need removal (see Highlight 6-11 and Section 7.3, EPA 2005).

Further, there is no justification for presuming that removal of these sediments would add minimal costs. Given that the PCB concentrations in this area are not appreciably different than

other PCB concentrations, it would be difficult to establish a clear-cut boundary or risk-based "action level" for defining where this additional dredging would start and stop; thus, the "chasing" of PCBs would likely result in significant cost increases.

EPA clarifies that although the comment indicates that PCB concentrations are elevated in the top 2 feet, there are actually no data representative of the 0-2 foot interval at this station. At Station SL4-10/10A, historical subsurface sediment data (from 1990) exist for the top 0.5 feet, 2-4 feet, and 6-8 feet, as follows:

- 0 – 0.5 feet: PCB concentrations are 358 ppm-carbon normalized (5.8 ppm dry weight).
- 0.5 to 2 feet: No samples analyzed. The reference to 347.9 ppm-carbon normalized data in Figure 2-8 of the EE/CA is an error, as noted in the errata section at the end of this responsiveness summary.
- 2 – 4 feet: PCB concentrations are 276 ppm-carbon normalized (3.8 ppm dry weight).
- 6 – 8 feet: PCB concentrations are 96.3 ppm-carbon normalized (5.2 ppm dry weight.

As noted above, more recent surface data in this area show that PCBs are well below the Cleanup Screening Level in surface sediments.

20. One surface hot spot not included in the removal/dredging plan should be added: PCBs, phthalates, and PAHs at sample locations along the mid-southern edge of the site should be removed (specifically, locations SL4-10A, SL4-5A, SCO4 and SD0063). (BD-3)

EPA does not agree that the sediments in the vicinity of these stations must be physically removed from Slip 4 to ensure that people and the environment are protected. EPA believes that the engineered sediment cap that will be placed in the vicinity of these stations, along with the required long-term monitoring components, will be protective of people and the environment.

Historic surface samples in this area showed that PAHs slightly exceeded the State of Washington Sediment Quality Standard (the lower of the two state standards) and that one phthalate exceeded the Cleanup Screening Level (the higher of the two state standards) (see Figure 2-7 in the EE/CA). The capping remedy designed for long-term isolation of PCBs in this area will also be protective for these other chemicals.

Also, see Response to Comment 19.

21. In Slip 4, contaminants should be contained during sediment dredging activities. Physical containment with a silt curtain or similar barrier, and frequent water quality monitoring during dredging, should be performed. (DRCC-13; PC-18)

EPA agrees that the short-term risks associated with dredging should be considered during the project design and construction. An analysis of this type of information is required in project

design documents, which include a Water Quality Monitoring Plan, and in removal action work plans that will be prepared by the City of Seattle and/or King County. Based on the analyses set forth in these documents, monitoring requirements and best management practices (e.g., specific dredging procedures) and potential engineering measures (e.g., containment barriers) for the project will be detailed for EPA review and approval. Project experience in Region 10 at similar sites has shown that typically, best management practices are successful in limiting contaminant resuspension and meeting water quality standards. Engineering measures such as silt curtains can be employed as a contingency, to be available if monitoring shows that the established best management practices are not meeting the water quality standards.

Further, EPA will identify project-specific requirements to ensure compliance with the substantive requirements of the Clean Water Act. These requirements will be described in a Clean Water Act Section 401 Water Quality Certification that is administered by EPA. The certification includes water quality monitoring, applicable water quality standards, allowable times for environmental work, and implementation of best management practices. Finally, best management practices (or "conservation measures") will be described in documents that are prepared for compliance with the Endangered Species Act.

22. The dredged sediments should be transported in a safe (covered) manner, and responsibly disposed of. (CC3-3) If we do remove sediments, what landfill will be used, and how is it constructed? (PC-36)

EPA agrees. All truck and rail transport containers will be covered. Dredged and excavated sediments and soils will be disposed of in landfills that are permitted for this type of material. Detailed information will be provided in project design documents and removal action work plans prepared by the City of Seattle, King County, and their subcontractor(s).

The specific landfill that will be used will be identified by the contractor performing the work. EPA must approve the use of the landfill prior to off-site shipment of materials.

The Washington Department of Ecology, which regulates landfills in our state, has provided information on sediment disposal at landfills (see Attachment B-1).

23. Sediments should be dredged by cutting out chunks of sediment (similar to making igloos) instead of using buckets that might have overflow and spread PCBs into the river. (PC-21)

EPA understands concerns about sediments being resuspended by dredgers, and EPA intends to require best management practices and engineering measures during construction to minimize the movement of contaminated sediments outside the Slip 4 Early Action Area. EPA is not aware of any dredging technologies that cut chunks of sediments – generally, sediments are very soft and watery and it is not possible for chunks to remain intact.

24. DRCC supports treatment of contaminated sediments wherever feasible, and challenges EPA to aggressively pursue alternative treatment technologies in order to craft environmentally responsible long-term solutions that offer true "cleanup" of contaminated

sediments. (DRCC-2) A regional treatment facility should be developed for sediment from all over the Duwamish and other sites in Puget Sound. (PC-24; PC-35)

EPA evaluated sediment treatment technologies for their applicability to the Slip 4 removal action. EPA determined that sediment treatment technologies would not be retained for further consideration in developing the cleanup alternatives set forth in the EE/CA. This information is thoroughly described in Section 4.5 of the EE/CA. EPA's determination for Slip 4 is consistent with Superfund's contaminated sediment guidance (EPA 2005), which states: "Based on available technology, treatment is not considered practicable at most sediment sites."

For the overall Lower Duwamish Waterway Site, EPA has been responsive to DRCC's concerns about treatment technologies. EPA held a briefing for DRCC and other stakeholders on sediment treatment in July 2004, and the current knowledge on sediment treatment technologies has been summarized in the report *Identification of Candidate Cleanup Technologies for the Lower Duwamish Waterway Superfund Site (RETEC, December 12, 2005)*. Similarly, the Port of Seattle and the City held a community workshop on sediment treatment for Slip 4 and T-117 in July 2005. EPA continues to work with DRCC in facilitating an information-sharing meeting on treatment technologies with Eric Stern (EPA Region 2).

25. The EE/CA includes a section on sediment treatment, which dismisses BioGenesis based on incomplete information and reliance on previous reports that are deeply flawed. (DRCC-16)

EPA believes that the information on BioGenesis presented in Section 4.5 of the EE/CA represents our understanding based on current knowledge about BioGenesis. As described in the EE/CA, EPA believes that BioGenesis is not viable for the early action sites in the Lower Duwamish Waterway Site because its effectiveness is unproven for Slip 4 sediments, pilot testing to prove its effectiveness would be expensive and time-consuming and would delay cleanup, it would be difficult to implement, and it is not cost-effective given current market conditions in the Northwest. EPA remains committed to furthering our understanding of available sediment treatment technologies, including BioGenesis, for the overall Lower Duwamish Waterway Site and we are currently planning an information-sharing meeting on this topic with DRCC and other stakeholders.

26. "Natural Recovery" is not appropriate for contaminants that do not degrade. The EE/CA should not include "natural recovery" as part of the remedy for these contaminants. (DRCC-7)

The selected alternative, Alternative 2, does not include "monitored natural recovery" as part of the remedy.

With regard to the concern that "natural recovery" is inappropriate for contaminants that do not degrade, EPA (2005) *Contaminated Sediment Remediation Guidance* includes monitored natural recovery (MNR) as a potential remedy for contaminated sediment (see Chapter 4). For an MNR remedy, biodegradation is only one of the many different natural processes that may reduce risk

from contaminated sediment (see Highlight 4-1 of EPA 2005). Burial of contaminated sediments by clean sediment is often the dominant process relied upon for natural recovery, with multiple physical, biological, and chemical mechanisms frequently acting together to reduce risk.

27. "Enhanced natural recovery" should not be included as part of Alternative 3 or 4 because contaminants will not degrade or appreciably break down. Instead, the contaminated sediments should be removed or capped. (DRCC-19)

EPA did not select Alternative 3 or 4 as the remedy for the Slip 4 Early Action Area, and Enhanced Natural Recovery (ENR) has not been identified as a component of the selected cleanup alternative (i.e., Alternative 2). With regard to the comment that ENR is not an appropriate remedy for contaminants that do not biodegrade, EPA (2005) *Contaminated Sediment Remediation Guidance* includes ENR as a remedy for contaminated sediment (see Section 4.5) that can be considered for remedy selection based on site-specific considerations.

EPA would like to clarify that for Alternatives 3 and 4, the primary cleanup technologies identified for contaminated sediments were *excavation/dredging* and *capping*. ENR was not identified as a primary cleanup technology. As described in Sections 5.3.1 and 5.4.1 of the EE/CA, ENR was identified as a potential contingency action only to address management of "residuals." After dredging or excavation action, some disturbed, contaminated material may remain at the new surface – this material is referred to as "residuals." Residuals can affect the dredged or excavated area as well as nearby surrounding areas. After construction, chemical sampling of the new sediment surface would occur to determine whether it meets cleanup standards. If cleanup standards were exceeded, Alternatives 3 and 4 proposed that residuals could be managed using one or more contingency actions (e.g., additional dredging, additional capping, monitored or enhanced natural recovery).

28. The removal action objective may not be sufficient to address the goal of significantly reducing exposure of ecological and human receptors to sediment contamination. Sediment and tissue concentration levels should be developed and utilized as performance standards to determine compliance with the goal of protecting ecological and human receptors. These sediment and tissue performance standards should be used in the long-term monitoring program and they are necessary to "reduce or eliminate the exposure pathways to PCBs in sediments within the removal area." (MIFTD-1)

EPA believes that the cleanup at the Slip 4 Early Action Area can meet our cleanup goals. The Slip 4 sediment cleanup will significantly reduce exposure of humans and ecological receptors to sediment contamination. The sediment with the highest PCB concentrations will be removed, and remaining sediments, which have lower concentrations, will be capped. Contaminated soils in banks will also be cleaned up. Further, the entire 3.6 acres of the Slip 4 Early Action Area will be capped with clean sand, gravel, and rock. These capping materials will not contain detectable levels of bioaccumulative chemicals, such as PCBs and mercury.

EPA recognizes the importance of protecting the Tribe's fishing rights in the Duwamish Waterway. As part of the overall risk assessments for the Lower Duwamish Waterway Site,

EPA will be evaluating "safe" levels in fish and shellfish tissue. However, this information is not yet available and continues to be a significant work effort for all parties involved. While the development of tissue-based performance standards is beyond the scope of this early action, EPA believes the Slip 4 cleanup will address risks to human and ecological receptors -- the entire Slip 4 Early Action Area will be capped with clean sand, gravel, and rock, and thus all chemical concentrations will be below background concentrations. EPA will evaluate whether contaminant levels need to be reduced in sediments to be protective beyond the Slip 4 boundary after completion of the human health and ecological risk assessments and the food web model for the overall Lower Duwamish Waterway Site.

29. Source control is incomplete. EPA and Ecology must fully identify ongoing sources of pollution, including portions of The Boeing Company Plant 2 that are uninspected, and develop an effective source control plan to protect Slip 4 from recontamination, before cleanup begins. (DRCC-5; BD-6; PC-3; PC-14; PC-26; PC-41)

EPA agrees that adequate source control efforts must be completed before the sediment cleanup begins, to minimize the potential for recontamination of sediments.

Ecology is the lead agency for source control efforts at the Lower Duwamish Waterway Superfund Site. Source control for some facilities, such as Boeing Plant 2, are managed under EPA's Resource Conservation and Recovery Act (RCRA). The Lower Duwamish Waterway Source Control Strategy (Ecology 2004) describes the process for identifying source control issues and implementing effective source controls for the waterway. The basic plan is to identify and manage sources of potential contamination and recontamination, in coordination with sediment cleanups.

A Source Control Action Plan for the Slip 4 Early Action Area is currently available for public review. The plan documents what is known about the area, the potential sources of recontamination, actions taken to address them, and how to determine when adequate source control is achieved for an area. Ecology will revise the Source Control Action Plan as new information is obtained and progress is made towards achieving source control.

Before the sediment cleanup begins, Ecology, in consultation with EPA, will determine when adequate source control actions have been implemented, to minimize the potential for recontamination of sediments. Following EPA and Ecology's assessment, and before implementing cleanup actions, the City of Seattle and King County will consider whether or not adequate source control actions have been implemented.

EPA has provided Ecology with a copy of DRCC's comment letter for its consideration during implementation of source control actions associated with the Slip 4 Early Action Area.

30. Will stormwater discharges from I-5 be treated prior to discharge to Slip 4? (PC-31)

Specific comments on source control activities have been forwarded to the Washington Department of Ecology for its consideration during development of the Source Control Action Plan for Slip 4.

31. We commend the agencies for their efforts to date to evaluate non-point pollution sources and work to control those sources in the drainages emptying into Slip 4. We encourage continued sustained and comprehensive source control to identify and abate remaining sources of pollution and to detect sources quickly. Cleanup and rehabilitation should occur after source control has accomplished a reduction in contamination such that subsequent pollution does not exceed levels that will cause harm to aquatic organisms. (WRIA-5)

Comment noted. Also see Response to Comment 29.

32. A more aggressive stance should be taken with Boeing with regard to source control. Boeing is probably a historical and ongoing source of a lot of the PCBs that are in the river. (PC-22; PC-32; PC-40)

EPA and Ecology continue to evaluate historical and ongoing sources of PCBs to the river. Boeing facilities that may have been and/or may currently be sources of contamination are part of that evaluation.

33. The storm drain pipes with stormwater from upland properties (The Boeing Company, Crowley Maritime, City of Seattle streets) should be re-routed so that they do not dump into Slip 4 where the cleanup is occurring. The pipes should be re-routed downstream where it is more fast flowing. Also, this would keep the area from being recontaminated and would give the salmon smolts a resting place from toxins and a place to adjust from fresh to saltwater. It is pointless to keep cleaning the same thing up over and over. (CC1-2)

The focus of the Source Control Strategy for the Lower Duwamish Waterway Site is to prevent recontamination of sediments to levels exceeding the Washington State Sediment Management Standards and the site-specific Lower Duwamish sediment cleanup goals. EPA and Ecology believe that the strategy will provide the framework and process for identifying source control issues and implementing effective controls, so that the Slip 4 area will not require additional cleanup in the future. Further, from an engineering and cost perspective, it is impracticable to move the locations and discharge points for these outfalls.

34. Alternative 1 or 2 is better for fish. (CC1-1)

EPA agrees that Alternatives 1 and 2 provide a higher quantity and quality of habitat for salmonid species, with Alternative 1 providing slightly less habitat benefits. The Superfund Natural Resource Trustees have also indicated a preference for creation of intertidal elevations suitable for the development of high and low marsh habitat adjacent to low-slope mudflat (Steinhoff 2006). Addition of marsh habitat would fill a niche to increase productivity and serve

as a refuge for fish, particularly juvenile Chinook salmon (a threatened species under the Endangered Species Act).

35. Alternative 4 is the best method to clean up Slip 4. More toxic material would be removed and Crowley Maritime would still be a taxpayer on that property. My second choice is Alternative 3. (CC2-1)

EPA understands that some people prefer to permanently remove as much contamination from the environment as possible. However, based upon an alternatives analysis using Superfund criteria for removal actions (effectiveness, implementability, and cost), EPA believes that Alternative 2 gives us the best risk reduction in consideration of the advantages and limitations of each alternative and a balancing of trade-offs among alternatives. Alternative 2 is protective of people and the environment, meets legal requirements, is implementable, and is cost-effective.

Under Alternative 2, EPA will ensure that the surface sediments will not have any chemicals that pose unacceptable risk to people or the environment, and the cap will be designed to ensure that over time, people and animals are not exposed to the remaining buried contaminated sediments.

Compared to the other three alternatives, Alternative 4 includes removal of more contaminated sediments that are buried at depth. As set forth in EPA (2005) guidance, exposure and risk are related to contaminants that are accessible to animals (e.g., near the surface). Contaminants that are deeply buried, have no significant migration pathway to the surface, and are unlikely to be exposed in the future, may not need removal. Removal of these deeper sediments may not reduce risk. (Also see Response to Comment 19).

EPA has considered future uses of Slip 4 in developing the four cleanup alternatives. Since Crowley Marine Services owns the majority of the submerged land (sediments) within the Slip 4 Early Action Area, the cleanup alternatives were developed in consideration of Crowley's navigation uses on its property. Also see Response to Comment 36.

36. All of the contaminated sediment should be removed from Slip 4. All PCBs, wherever they exist, should be removed and destroyed. (PC-11; PC-17) After removing all of the contaminated sediment, it should be replaced with habitat and Crowley should not use the area because it is a depositional environment and would need to be dredged every so many years. (PC-16)

See Response to Comment 35. EPA does not believe that it is necessary to remove all of the contaminated sediment from Slip 4 because there are other reasonable alternatives that address the risk posed by these contaminated sediments.

EPA understands that some people prefer to permanently remove as much contamination from the environment as possible. In developing the removal alternatives in the EE/CA, consideration was given to a "maximum feasible removal" alternative, involving removal of most or all of the contaminated sediments within Slip 4 (see pp. 76-78 of the EE/CA). This approach would require extensive engineering measures, and the total cost would be estimated in the range of $15

to $20 million. Given site-specific considerations and limitations, the "maximum feasible removal" of all contaminated sediments would have greater short-term impacts during construction, and would have substantially greater incremental costs than other, equally protective, alternatives. The incremental cost of this approach is considered to be substantial and disproportionate to any benefits, and therefore, the "maximum feasible removal" approach was not carried forward to the analysis of alternatives.

37. Combine Alternatives 2 and 4 – purchase the land from Crowley, dredge all the contaminated sediments that can be feasibly removed so the cleanup is more permanent, create habitat and neighborhood restoration, and create public access. (PC-37; PC-39)

See Responses to Comments 35 and 36.

38. The EE/CA should reference the negotiations between the City and Crowley Marine Services for the purchase of Slip 4. (DRCC-10)

The EE/CA references negotiations between the City of Seattle and Crowley Marine Services in Section 5.

39. Determine whether the decline in surface sediment PCB concentrations is due to source control improvements or physical processes (p. 22 of the EE/CA). (DRCC-18)

EPA believes that the decline in surface sediment PCB concentrations that has been observed over the past 10 to 15 years is a result of both physical processes (sedimentation, dispersion, dilution, bioturbation) and source control improvements (e.g., reduction in PCB inputs). EPA does not believe that it is scientifically feasible, nor necessary, to calculate the percentages of the decline that are attributable to physical processes versus source control improvements.

40. Although we recognize that pre- and post-project monitoring of juvenile salmonid usage and general ecosystem health are not typically required for projects such as the Slip 4 cleanup, we encourage EPA to explore ways to invest in this type of monitoring as it may yield valuable information that will save money and improve the efficacy of future cleanup and habitat rehabilitation. (WRIA-4)

EPA does not anticipate requiring the City of Seattle and King County to perform monitoring of juvenile salmonid usage and general ecosystem health. The focus of long-term monitoring in Slip 4 will be on ensuring that the concentrations of sediment contaminants within the early action area are protective of human health and the environment. The development of the long-term monitoring plan, and the long-term monitoring results, will be shared with the public and stakeholders.

41. Habitat should be created up the flume. (PC-19)

The creation of habitat up the flume is beyond the scope of this Superfund project.

42. Salmon smolts should not be allowed to come into Slip 4 because they might pick up contamination from the outfalls that discharge to Slip 4. By creating habitat for smolts in Slip 4, the salmon are being encouraged to come into a place that might have contamination (i.e., from the ongoing discharges from the pipes at the head of Slip 4). (PC-20)

The habitat elements of Alternative 2 were developed in consideration of the preferred habitat types for salmonids that have been identified by the Superfund Natural Resource Trustees for the Duwamish Waterway. Marsh and mudflat habitats with high functional value in intertidal areas are particularly desirable.

EPA does not intend to restrict salmon access to Slip 4. EPA's goal is to ensure that the sediment cleanup in Slip 4 is protective of ecological receptors. As the lead agency for source control, Ecology's goal is to ensure that sources are controlled in a manner that is also protective of ecological receptors.

43. Boeing should pay for their fair share of the pollution they have caused in the Duwamish River. (CC3-1)

EPA agrees. To avoid cleanup delays for this project, the City and King County have agreed to fund the cleanup of Slip 4, while final cost allocation for the Slip 4 work is determined on a separate track. Also, Boeing is one of four parties implementing the Remedial Investigation/Feasibility Study (RI/FS) for the Lower Duwamish Waterway Site, and EPA will require that Boeing pay its fair share of whatever remedy EPA selects based on the RI/FS. Boeing is also implementing an EPA corrective action order addressing sources of contamination to the Lower Duwamish Waterway from Boeing's Plant 2 facility, and will be implementing source control measures at its other Lower Duwamish Waterway facilities under oversight by the Washington Department of Ecology.

44. As a maritime industrial user of the Duwamish River, Alternatives 3 and 4 are the best options to clean up Slip 4. Any limitation on the ability to use Slip 4 to its maximum advantage will have a much greater economic impact on our area for years to come over the increased cost of additional dredging. (Manson-1)

EPA has considered future uses of Slip 4 in developing the four cleanup alternatives. Since Crowley Marine Services owns the majority of the submerged land (sediments) within the Slip 4 Early Action Area, the cleanup alternatives were developed in consideration of Crowley's navigation uses on its land. Under Alternatives 3 and 4, historically permitted navigation depths would be re-established in the inner berth of Crowley's property. Under Alternatives 1 and 2, Crowley's potential use of a permitted berthing area in the inner portion of the slip would be limited; as compensation, the City of Seattle agreed to purchase the affected property from Crowley if this alternative were selected. Under each of the alternatives, the owner of the submerged lands would clearly have the ability to impact future use on its property.

Economic analyses regarding the effect of land use in Slip 4 on the broader economy are beyond the scope of this Superfund project.

45. Navigational use of Slip 4 is valuable, but salmon habitat and habitat anywhere along the river is extremely valuable. (PC-15)

Comment noted.

46. Why aren't we cleaning up the uppermost contaminated parts of the river, and then progressing down the river to avoid any recontamination? (Manson-2)

EPA agrees that it would seem logical to start early actions upstream and move systematically downstream. However, such an approach would potentially delay cleanup of the most highly contaminated locations for several years while we identify and control sources, and address less-contaminated upstream areas. EPA believes that sediment contamination in certain areas of the river is associated with greater ecological and/or human health risk, and that early cleanup of these more contaminated areas (regardless of their location along the river) will result in more immediate risk reduction to people and the environment. The rationale for identifying areas to be remediated on an expedited schedule is described in the report entitled "Identification of Candidate Sites for Early Action" developed for the site-wide Remedial Investigation report (Windward 2003). As importantly, EPA believes that during cleanup, best management practices and engineering measures can be implemented to minimize the potential for contaminated sediments moving outside the cleanup area.

47. Revise the EE/CA to include the recent NOAA study on PCBs in salmonids. (DRCC-17)

Salmonid data, including PCB tissue studies, are discussed in Section 2.1.8.2 of the EE/CA. EPA has requested that DRCC provide more details about the "recent NOAA study," as NOAA was not sure what study was being referenced in the comment.

48. Thank you for working with our community, and for listening to our input. (PC-33; PC-38)

Thank you for your input.

49. Thank you for your efforts in restoring the Duwamish River. (CC1-3; Manson-3)

Thank you for your input.

Errata for the EE/CA

During the public review process on the EE/CA, EPA identified the following errata for the EE/CA:

1. The Boeing outfalls that are referenced as 24 inch outfalls in the EE/CA are actually 30 inch outfalls.

2. Figure 2-8. For the historical core data (Landau 1990), Station SL4-10A includes a reference to surface concentrations of PCBs at "SL4-12A". This reference should be SL4-10A. Also, Station SL4-10A includes a reference to a carbon-normalized PCB concentration of "347.9" ppm-OC, and this value should be deleted – there are no PCB data for the 0-2 ft interval.

References

EPA. 1998. Assessment and Remediation of Contaminated Sediments (ARCS) Program. Guidance for In-Situ Subaqueous Capping of Contaminated Sediments. EPA 905-B96-004.

EPA. 2005. Contaminated Sediment Remediation Guidance for Hazardous Waste Sites. EPA-540-R-05-012. OSWER 9355.0-85.

Steinhoff, Marla. 2006. Personal communication from Marla Steinhoff, NOAA, to Karen Keeley, EPA, dated March 6, 2006.

Windward. 2003. Task 5: Identification of Candidate Sites for Early Action. Technical Memorandum: Data Analysis and Candidate Site Identification. Final. Lower Duwamish Waterway Remedial Investigation. Submitted to the U.S. Environmental Protection Agency and Washington State Department of Ecology by the Lower Duwamish Waterway Group.

Attachment B-1

Sediment Disposal at Landfills[1]

When contaminated sediments are dredged from a cleanup site, they are disposed of at modern, closely regulated and monitored landfills. Two landfills that are commonly are Roosevelt Regional Landfill, located near Goldendale, WA in Klickitat County; and the Chemical Waste Management Landfill, located near Arlington, OR in Gilliam County.

Roosevelt Landfill is regulated by Klickitat County under a Solid Waste Handling Permit delegated from the EPA and the State Department of Ecology. A Department of Ecology air quality permit is in place to manage air emissions limits and air monitoring for the landfill. The County employs a full-time inspector who oversees landfill operations, and works to ensure that all permit requirements are fulfilled. Air emissions (including toxic air emissions) are monitored at the landfill under a Department of Ecology air quality permit. Roosevelt also has one of the largest landfill gas-to-energy generation plants in the region, providing a significant portion of Klickitat County's power.

Roosevelt Landfill cannot accept materials that are designated as Hazardous Waste or Dangerous Waste under state regulations. All materials taken by Roosevelt Landfill must pass strict testing to determine that they contain no inappropriate waste levels. Materials that do designate as Hazardous or Dangerous go to a landfill in Arlington, Oregon that is especially designed to accept and manage these materials (see below).

Sediments are usually delivered to the landfill by railcar, where they are tipped into trenches dug into existing landfill material, and then covered. One reason this is being done is because the landfill needs water, due to less than expected rainfall the last several seasons. Appropriate levels of water in the landfill assist with the biological breakdown of landfill material. Because the sediment dredge spoils are wet, they help make up the landfill water deficit. Trenching and covering the sediments helps retain this water.

The natural geology below the arid hills of Klickitat County creates an ideal location for the landfill including:

- 1,500 separation from the bottom of the landfill to the closest regional aquifer.
- The geology separating the landfill and this regional aquifer includes 340 feet of low permeability natural clay.
- Tests of the clay demonstrate performance at 10-8 cm/sec, meaning it would take approximately 15,000 years for water to move through this barrier.
- A small, local aquifer 100 feet below the surface is confined to the site and provides responsive groundwater monitoring.
- The site receives approximately 6-9 inches of precipitation a year.

Additional Engineering creates a secure site:

[1] This information was prepared by Rick Huey, Washington State Department of Ecology, and provided to Karen Keeley, U.S. EPA, on April 21, 2006.

- A secondary liner consisting of a two-foot thick, re-compacted natural clay layer (10-7cm/sec), or a performance based equivalent geosynthetic clay liner (GCL).
- A primary liner consisting of 80 mil high density flexible membrane liner (FML) which exceeds the regulatory prescribed 60 mil primary FML.
- A geotextile overlays the FML and is covered with highly permeable (greater than 10-2 cm/sec) aggregate for leachate collection.
- Comprehensive leachate and methane collection and control systems. Leachate is collected and recirculated into the landfill.
- An onsite power plant to convert the methane collected into electricity.
- A daily cover of approximately six inches of dirt or desiccated dredge spoils is used to cover materials in the landfill.

For further information:

- Tim Hopkins, Klickitat County Director of Solid Waste at TimH@co.klickitat.wa.us or 509-773-4448

- Kip Eagles, Department of Ecology Solid Waste Program at keag461@ecy.wa.gov or 509-575-2837

- http://www.rabanco.com/regional_landfill/default.aspx

- http://www.klickpud.com/power/lfg.asp

Chemical Waste Management Landfill (CWM), located near Arlington, OR is the only northwest region waste management disposal facility certified to accept Hazardous or Dangerous wastes, including Toxic Substance Control Act (TSCA) regulated waste with PCB concentrations greater than 50 parts per million.

Permitting and monitoring of CWM is delegated from the U.S. EPA to the Oregon State Department of Environmental Quality. The landfill is designed and operated under highly regulated and prescribed procedures, and is engineered to protect surface and ground water through the highest environmental control.

Factors that help with environmental protection at CWM include:

- A small, local aquifer 250 feet below the surface is confined to the site. Groundwater protection is monitored through the use of 64 monitoring wells.
- Tests demonstrate that it would take thousands of years to reach the uppermost aquifer is currently not pumped for groundwater use).
- The site receives approximately 8-10 inches of precipitation a year.

- There are 3 operating landfills. Two are double lined. The third has a lined tertiary sump and uses a series of geotextile liners along with soil/bentonite clay liners along the sides and bottom of the landfill.
- Because there are no liquids disposal or municipal waste, methane collection is not needed. Leachate is collected, treated in bulk liquid waste treatment system, then discharged to one of two surface impoundments.
- A daily cover in combination with sprayed water protects the integrity of the buried material and controls dust.

For further information from Oregon Department of Environmental Quality:

- Fredrick Moore, OR DEQ Permit Manager, Moore.Fredrick@deq.state.or.us or 541- 388-6146 extension 242.

- http://www.deq.state.or.us/wmc/solwaste/disposal.html

Chemical Waste Management Landfill homepage:

- http://www.wmnorthwest.com/landfill/landfillcities/chemicalwaste.html

CWM Education Resources (see documents for general landfill construction, operation and environmental information):

- http://www.wm.com/WM/community/Resources.asp?id=sub6